

ADDITIONS, TAXONOMIC CORRECTIONS, AND FAUNAL  
AFFINITIES OF THE STONEFLIES (PLECOPTERA) OF  
VIRGINIA, USA

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*Abstract.*—One hundred and forty-nine species of stoneflies are recorded from Virginia. Of these, 80 species have distributions associated with the Appalachian Mountains, 57 are widely distributed east of the Rocky Mountains, 6 are associated with the Coastal Plain Physiographic Province, and 6 have ranges which include both the Appalachians and the Coastal Plain. There are apparently 7 regional endemic species. Twenty-one species are recorded from Virginia for the first time.

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Kondratieff and Voshell (1979) reported 116 species of Plecoptera known from Virginia in their checklist of the stoneflies of Virginia. Since 1979, 21 state records have been added and seven new species described from Virginia. There also have been several recent important taxonomic changes: Peltoperlidae (Stark and Stewart, 1981), Pteronarcyidae (Stark and Szczytko, 1982), Perlodidae (Stewart and Stark, 1984; Szczytko and Stewart, 1981), Chloroperlidae (Surdick, 1985), and Perlidae (Zwick, 1984). Three genera, *Isoperla* by Szczytko, *Sweltsa* by Surdick, and *Perlesta* by Stark, are being revised and will add additional taxa to Virginia.

This species list is presented to provide a framework for future studies of the Plecoptera of Virginia, including an identification manual. The 149 species reported herein from Virginia are the most recorded from any state or province from the Nearctic re-

gion. The following numbers of species have been reported from surrounding states: Kentucky—77 (Tarter et al., 1984), North Carolina—about 130 (Unzicker and McCaskill, 1982), and West Virginia—106 (Tarter and Kirchner, 1980).

The richness of the stonefly fauna from Virginia is indicative of the range of topography which allows for heterogeneously diverse habitats. Five major physiographic provinces of eastern North America (Coastal Plain, Piedmont Plateau, Blue Ridge, Ridge and Valley, and the Appalachian Plateau) are represented in Virginia (Hoffman, 1969). Fig. 1 delimits the physiographic provinces of Virginia and the major river systems. Virginia has eight major river basins, several of old geographical systems such as the New River (Hoffman, 1969). The topographic relief of Virginia ranges from sea level to 1743 m (Mt. Rogers, 5720 ft.).

The distribution of Plecoptera of Virginia has three basic patterns. Eighty species are closely linked with the central Appalachians and foothills of the upper Piedmont Plateau region. This area has one of the most diverse

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<sup>1</sup> The views of the Author do not purport to reflect the position of the Department of the Army or the Department of Defense.

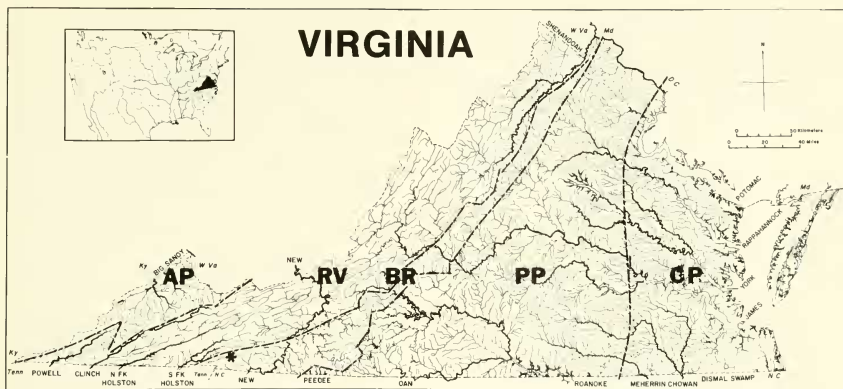


Fig. 1. Physiographic provinces of Virginia (according to Hoffman, 1969). CP = Coastal Plain; PP = Piedmont Plateau; BR = Blue Ridge; RV = Ridge and Valley; AP = Appalachian Plateau. The symbol \* identifies Mt. Rogers.

fauna and flora assemblages of the North Temperate Zone. Immatures of these species usually occur in cooler streams or springs of the Appalachian Plateau, Ridge and Valley, Blue Ridge, and Piedmont Plateau provinces. Some of these species are predominantly southeastern Appalachian, with southern Virginia being their northern limit of distribution. Included in this group are *Allocaupnia fumosa* Ross, *A. stannardi* Ross, *Alloperla nanina* Banks, *Megaleuctra williamsae* Hanson, *Strophopteryx limata* (Frison), *Sweltsa mediana* (Banks), *S. urticae* (Ricker), and *Yugus arinus* (Frison). The northern border of the southern Appalachians is generally considered to be where the Roanoke River slices through the Blue Ridge Mountains (Fig. 1). Most of the species listed above may be collected from streams draining Virginia's highest peaks, Mt. Rogers-White Top area in Grayson, Smyth, and Washington counties (Fig. 1).

Several Appalachian species have strong northeastern affinities, and Virginia includes their southern distribution limits. These species may have survived the ice ages in the extensive unglaciated areas of

Canada. These likely northern emigrants include: *Allocaupnia maria* Hanson (most southern record, Smyth County), *Alloperla banksi* Frison, all four of the eastern species of *Ostrocerca*, and *Sweltsa naica* (Provancher).

Many species, however, are widespread, occurring all along the Appalachian Mountains from Canada to Georgia: *Acroneuria carolinensis* (Banks), *Bolotoperla rossi* (Frison), *Hansonoperla applachia* Nelson, *Mallirekus hastatus* (Banks), and *Sweltsa onkos* (Ricker).

About 57 species may be considered to have widespread boreal distributions. These generally occur east of the Rocky Mountain region. In Virginia, these species are found in all five physiographic provinces. Good examples are *Acroneuria abnormis* (Newman), *Allocaupnia granulata* (Claassen), *A. recta* Claassen, *A. rickeri* Frison, *Alloperla caudata* Frison, *Amphinemura nigrilla* (Provancher), *Attaneuria ruralis* (Hagen), *Clioperla clio* (Newman), *Haploperla brevis* (Banks), *Isoperla bilineata* (Say), *Leuctra ferruginea* (Walker), *Perlinella drymo* (Newman), *P. ephyre* (Newman), *Prostoia*

*completa* (Walker), *P. similis* (Hagen), *Neoperla clymene* (Newman), and *Strophopteryx fasciata* (Burmeister).

Six species are generally restricted to the Coastal Plain physiographic province, and as Stark (1979) stated, occupy "a boomerang shaped range that extends northward along the Atlantic Coast and to the west along the Gulf Coast." *Acroneuria arenosa* (Banks), *Neoperla carlsoni* Stark and Baumann, and *Taeniopteryx lonicera* Ricker and Ross are examples of this group. Nymphs of these species are most commonly collected on submerged woody substrate and among accumulated organic debris in the many shifting sand streams of the area. Adults of the perlids are often only collected in numbers using light traps. Several species, including *Allocapnia virginiana* Frison, *A. wrayi* Ross, *Eccopectura xanthenes* (Newman), *Helopicus subvarians* (Banks), and *Paragnetina fumosa* (Banks) range throughout the Coastal Plain but also occur in the Appalachians.

There are apparently several regional endemic species whose affinities are clearly with the Appalachian fauna. These include *Diploperla morgani* Kondratieff and Voshell, *D. kanawholensis* Kirchner and Kondratieff, *Alloperla biserrata* Nelson and Kondratieff, *Taeniopteryx nelsoni* Kondratieff and Kirchner, *Allocapnia harperi* Kirchner, and *Tallaperla lobata* Stark.

Significant range extensions are noted for several species. *Isogenoides varians* (Walsh) was collected from Bedford County (Big Otter River). This species is known from Illinois, Indiana, Michigan, Mississippi, South Carolina, and Tennessee (Stewart and Stark, 1984). The Big Otter River has a diverse stonefly fauna. *Diploperla kanawholensis* was also collected from this river and represents a new state record (Kirchner and Kondratieff, 1984). The eastern species of *Ostrocerca* have been considered rare. However, the four eastern species often occur abundantly but locally in the Appalachian region of Virginia.

In the list that follows, the 21 new state records are indicated by # and the seven species described since 1979 by +. In addition, 21 other species that probably occur in Virginia are indicated by \*, and the adjacent states where they have been reported are listed in parentheses. Each species in the following list is identified by its continental distribution: widespread boreal species (WB), Appalachian (AP), and Coastal Plain (CP), and Appalachian-Coastal Plain distribution (AP-CP). We are following the classification of Zwick (1973). The following papers are necessary to supplement those listed by Kondratieff and Voshell (1979) to identify the stoneflies of Virginia and surrounding states: Harper and Stewart (1984), Kirchner (1980, 1982), Kirchner and Harper (1983), Kirchner and Kondratieff (1984, 1985), Kondratieff and Kirchner (1982a, 1982b), Kondratieff and Voshell (1981, 1982), Kondratieff et al. (1981), Nelson (1979, 1982), Nelson and Kondratieff (1983), Stark (1983, 1985, 1986), Stark and Ray (1983), Stark and Stewart (1981), Stark and Szczytko (1981), Stewart and Stark (1984), Surdick (1985), and Szczytko and Stewart (1976).

#### LIST OF STONEFLIES OF VIRGINIA

ORDER PLECOPTERA  
SUBORDER ARCTOPERLARIA  
GROUP EUHOLOGNATHA  
SUPERFAMILY NEMOUROIDEA  
FAMILY Nemouridae  
SUBFAMILY Amphinemurinae

*Amphinemura delosa* (Ricker) WB  
*A. nigrilla* (Provancher) WB  
*A. wui* (Claassen) AP

#### SUBFAMILY Nemourinae

*Ostrocerca albidipennis* (Walker) AP  
# *O. complexa* (Claassen) AP  
# *O. prolongata* (Claassen) AP  
*O. truncata* (Claassen) AP  
*Paranemoura perfecta* (Walker) AP

*Prostoia completa* (Walker) WB  
 + *P. hallasi* Kondratieff & Kirchner CP  
*P. similis* (Hagen) WB  
*Shipsa rotunda* (Claassen) WB  
*Soyedina carolinensis* (Claassen) AP  
*S. vallicularia* (Wu) AP  
 \* *Zapada chila* (Ricker) (TN) AP

FAMILY Taeniopterygidae  
 SUBFAMILY Brachypterinae

*Bolotoperla rossi* (Frison) AP  
*Oemopteryx contorta* (Needham & Claassen) AP  
 \* *O. glacialis* (Newport) (WV) WB  
*Strophopteryx appalachia* Ricker & Ross AP  
*S. fasciata* (Burmeister) WB  
*S. limata* (Frison) AP  
*Taenionema atlanticum* Ricker & Ross AP

SUBFAMILY Taeniopteryginae

*Taeniopteryx burksi* Ricker & Ross WB  
 # *T. lita* Frison CP  
*T. lonicerca* Ricker & Ross WB  
*T. maura* (Pictet) WB  
*T. metequi* Ricker & Ross WB  
 + *T. nelsoni* Kondratieff & Kirchner AP  
*T. parvula* Banks WB  
*T. ugola* Ricker & Ross AP

FAMILY Capniidae

*Allocapnia aurora* Ricker AP  
 \* *A. brooksi* Ross (TN) AP  
*A. curiosa* Frison AP  
 \* *A. forbesi* Frison (KY, TN, WV) WB  
*A. frisoni* Ross & Ricker AP  
 \* *A. frumi* Kirchner (WV) AP  
*A. fumosa* Ross AP  
*A. granulata* (Claassen) WB  
 + *A. harperi* Kirchner AP  
*A. illinoensis* Frison WB  
*A. loshada* Ricker AP  
*A. maria* Hanson AP  
*A. mystica* Frison AP  
*A. nivicola* (Fitch) WB  
*A. pygmaea* (Burmeister) WB  
*A. recta* (Claassen) WB  
*A. rickeri* Frison WB  
 + *A. simmonsii* Kondratieff & Voshell AP

*A. stannardi* Ross AP  
*A. virginiana* Frison AP-CP  
*A. vivipara* (Claassen) WB  
*A. wrayi* Ross AP-CP  
*A. zola* Ricker AP  
*Nemocapnia carolina* Banks WB  
*Paracapnia angulata* Hanson AP

FAMILY Leuctridae  
 SUBFAMILY Megaleuctrinae

*Megaleuctra flinti* Baumann AP  
 # *M. williamsae* Hanson AP

SUBFAMILY Leuctrinae

*Leuctra alexanderi* Hanson AP  
*L. grandis* Banks/*biloba* Claassen AP  
*L. carolinensis* Claassen AP  
*L. duplicata* Claassen AP  
*L. ferruginea* (Walker) WB  
*L. mitchellensis* Hanson AP  
*L. monticola* Hanson AP  
 \* *L. nephophila* Hanson (NC, TN) AP  
 # *L. rickeri* James WB  
*L. sibleyi* Claassen AP  
 # *L. tenella* Provancher WB  
*L. tenuis* (Pictet) WB  
*L. triloba* Claassen AP  
*L. truncata* Claassen AP  
*L. variabilis* Hanson AP  
*Paraleuctra sara* (Claassen) WB

GROUP SYSTELLOGNATHA  
 SUPERFAMILY PTERONARCYOIDEA  
 FAMILY Pteronarcyidae

*Pteronarcys biloba* Newman AP  
*P. comstocki* Smith AP  
*P. proteus* Newman AP  
*P. scotti* Ricker AP  
*P. dorsata* (Say) WB

SUPERFAMILY PELTOPERLOIDEA  
 FAMILY Peltoperlidae  
 SUBFAMILY Peltoperlinae

*Peltoperla arcuata* Needham AP  
*P. tarteri* Stark & Kondratieff AP  
*Tallaperla anna* (Needham & Smith) AP  
 # *T. cornelia* (Needham & Smith) AP  
 # *T. laurie* (Ricker) AP

- + *T. lobata* Stark AP  
*T. maria* (Needham & Smith) AP  
 \* *Viehopera ada* (Needham & Smith) (NC, TN) AP

SUPERFAMILY PERLOIDEA  
 FAMILY Perlodidae  
 SUBFAMILY Isoperlinae

- Clioperla clio* (Newman) WB  
*Isoperla bilineata* (Say) WB  
 \* *I. bellona* Banks (NC, TN) AP  
*I. burksi* Frison WB  
 \* *I. cotta* Ricker (WV) WB  
 # *I. couthatta* Szczytko & Stewart CP  
*I. dicala* Frison WB  
 \* *I. distincta* Nelson (NC, TN) AP  
 \* *I. gibbsae* Harper (WV) AP  
*I. holochlora* (Klapalek) AP  
*I. lata* Frison WB  
 + *I. major* Nelson & Kondratieff AP  
*I. marlynia* Needham & Claassen WB  
*I. montana* (Banks) AP  
*I. orata* Frison AP  
 \* *I. richardsoni* Frison (WV) WB  
*I. signata* (Banks) WB  
*I. similis* (Hagen) AP  
*I. slossonae* (Banks) WB  
 # *I. transmarina* (Newman) WB

SUBFAMILY Perlodinae

- Cultus decisus* (Walker) WB  
*Diploperla duplicata* (Banks) AP-CP  
 # *D. kanawholensis* Kirchner & Kondratieff AP  
*D. morgani* Kondratieff & Voshell AP  
*D. robusta* Stark & Gaufin WB  
*Helopicus subvarians* (Banks) AP-CP  
*Isogenoides hansonii* (Ricker) AP  
 # *I. varians* (Walsh) WB  
*Malirekus hastatus* (Banks) AP  
 \* *Oconoperla innubila* (Needham & Claassen) (NC, TN) AP  
*Remenus bilobatus* (Needham & Claassen) AP  
*Yugus arinus* (Frison) AP  
*Y. bulbosus* (Frison) AP

FAMILY Chloroperlidae  
 SUBFAMILY Paraperlinae

- \* *Utaperla gaspesiana* Harper & Roy (WV) AP

SUBFAMILY Chloroperlinae

- \* *Alloperla aracoma* Harper & Kirchner (WV) AP  
*A. atlantica* Baumann AP  
*A. banksi* Frison WB  
*A. biserrata* Nelson and Kondratieff AP  
*A. caudata* Frison WB  
*A. chloris* Frison AP  
*A. concolor* Ricker AP  
*A. ideii* (Ricker) AP  
*A. imbecilla* (Say) WB  
*A. nanina* Banks AP  
 \* *A. neglecta* Frison (NC, TN) AP  
*A. usa* Ricker AP  
*Haploperla brevis* (Banks) WB  
*Suwallia marginata* (Banks) AP  
*Sweltsa lateralis* (Banks) AP  
*S. mediana* (Banks) AP  
*S. naica* (Provancher) AP  
*S. onkos* (Ricker) WB  
*S. urticae* (Ricker) AP  
 \* *Rasvena terna* (Frison) (NC, TN, WV) AP

FAMILY Perlidae

SUBFAMILY Acroneuriinae

- Acroneuria abnormis* (Newman) WB  
*A. arenosa* (Pictet) CP  
 \* *A. arida* (Hagen) (TN) WB  
*A. carolinensis* (Banks) AP  
*A. evoluta* Klapalek WB  
*A. filicis* Frison WB  
*A. flinti* Stark & Gaufin AP  
 # *A. internata* (Walker) WB  
*A. lycorias* (Newman) WB  
 \* *A. perplexa* Frison (TN, WV) WB  
 \* *A. petersi* Stark & Gaufin (NC, TN) AP  
*Attaneuria ruralis* (Hagen) WB  
 \* *Beloneuria stewarti* Stark & Szczytko (NC, TN) AP  
*Eccoptura xanthenes* (Newman) AP-CP  
 # *Hansonoperla appalachia* Nelson AP



*Perlesta placida* (Hagen) "complex" WB  
*Perlinella drymo* (Newman) WB  
*P. ephyre* (Newman) WB

## SUBFAMILY Perlinae

# *Neoperla carlsoni* Stark & Baumann CP  
 # *N. catharae* Stark & Baumann WB  
 # *N. clymene* (Newman) WB  
 \* *N. choctaw* Stark & Baumann (WV) WB  
*N. freytagi* Stark & Baumann WB  
 # *N. stewarti* Stark & Baumann WB  
*Paragnetina fumosa* (Banks) AP-CP  
*P. immarginata* (Say) AP  
 # *P. ichusa* Stark & Szczytko AP  
*P. media* (Walker) AP  
 # *Agnentina annulipes* (Hagen) CP  
*A. capitata* (Pictet) WB  
 # *A. flavescens* (Walsh) WB

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